

Intelligent 5G LAN Routing Architecture

MAY 2022

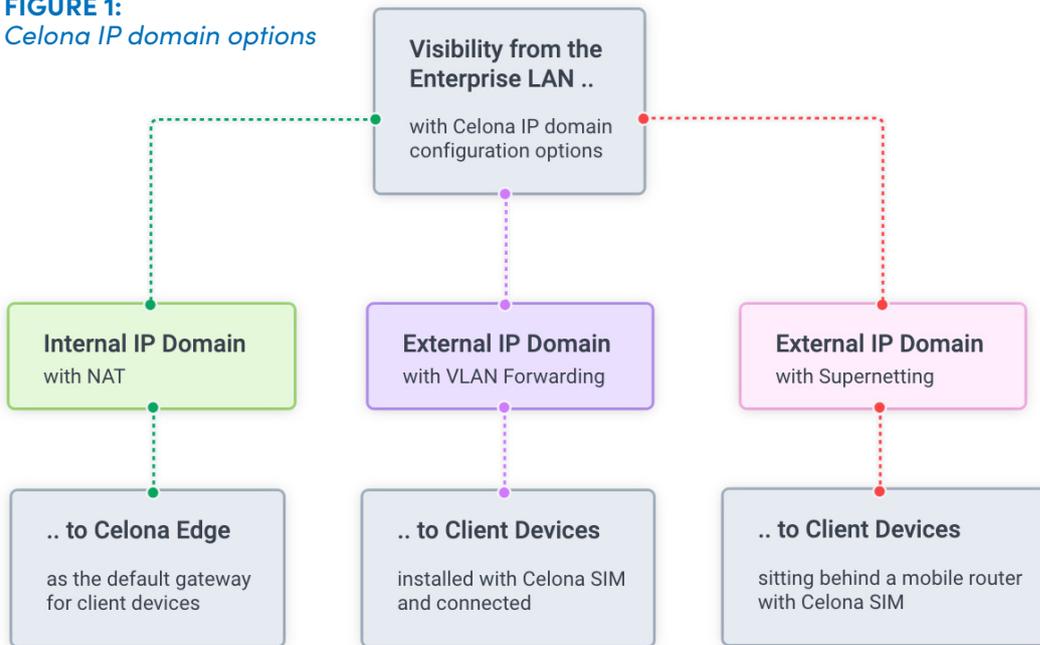
INTRODUCTION

Celona is focused on providing an all-in-one, turn-key 5G LAN platform for the enterprise that offers flexible integration, simplified operational management and unmatched network visibility. As such, Celona has developed a pair of intelligent routing options to help you get there. The purpose of this paper is two-fold. First, it will discuss the two different IP Domain options for integrating a Celona 5G LAN with an existing corporate LAN. Readers will also learn how supernetting techniques built into the Celona Edge can radically simplify complex routing topologies within the 5G LAN, increasing visibility while simultaneously reducing the management burden in many use-case deployment scenarios.

Device visibility

One aspect that sets Celona apart from other private 5G offerings is the ability to configure routing based on the level of visibility required for a specific use-case deployment. The following diagram presents a logical depiction of the level of visibility observed using either the internal IP domain or the external IP domain with and without supernetting. An internal IP domain will hide all private cellular devices behind network address translation, while an external IP domain extends the enterprise network into directly connected client devices. Finally, the external IP domain mode combined with supernetting allows the corporate network to extend to non-native cellular client devices through mobile routers in a scalable fashion while still allowing for full visibility and direct access:

FIGURE 1:
Celona IP domain options



What is a Celona IP domain?

Options on how the Celona 5G LAN platform handles the forwarding of cellular data into the corporate LAN is controlled by what’s known as the IP domain. On the Celona Orchestrator, IP domain options are configured within the Edge Clusters menu. Note that each cluster’s IP domain can be configured independently from others. Additionally, up to 16 IP domains can be configured on a single edge cluster, if desired.

The IP domain type is how architects can dictate how the 5G LAN will translate and forward packets to a corporate LAN. There are two distinct types: internal and external.

Defining Celona IP domain architecture types

Each Celona Edge cluster can operate as an Internal IP domain -- a layer 3 router with network address translation (NAT), or as an External IP domain -- using the corporate LAN for routing and DHCP services. Each IP Domain type is described as follows:

Internal IP domain

Internal IP domains are fully managed by the Celona Edge. This means that all routing within the 5G LAN is handled by the Celona Edge as are DHCP and DNS services for all devices on the IP domain.

By default, every Celona Edge cluster is configured as an internal IP domain. This mode enables source NAT services on the Celona Edge. All devices residing on the 5G LAN rely on the Edge platform to hand out DHCP/DNS information.

Any traffic entering or exiting the network in NAT mode will be translated by the Celona Edge platform into a single IP address that is reachable on the corporate LAN. This mode is commonly used for rapid deployments where devices external to the Celona 5G LAN do not need direct access to connected private cellular capable devices.

The downside, however, is that 5G LAN devices are not accessible from the corporate LAN. Thus, for more complex or permanent deployments where devices must communicate and/or be monitored via devices directly connected to the corporate LAN, the external IP domain mode will be a better architectural fit.

Figure 2 depicts an example Celona 5G LAN platform configured in the Internal IP domain mode. The Celona Edge is responsible for providing DHCP services to devices in the 172.31.0.0/16 subnet. When these devices need to send data to the LAN, the Celona Edge translates devices in the 172.31.0.0/16 subnet to 10.1.0.20 which is the IP address of the Celona Edge server that directly connects to the corporate LAN:

On the Celona Orchestrator, the Internal IP domain configuration options are shown below (next page):

FIGURE 2 (below):
 Logical topology for Internal IP domains

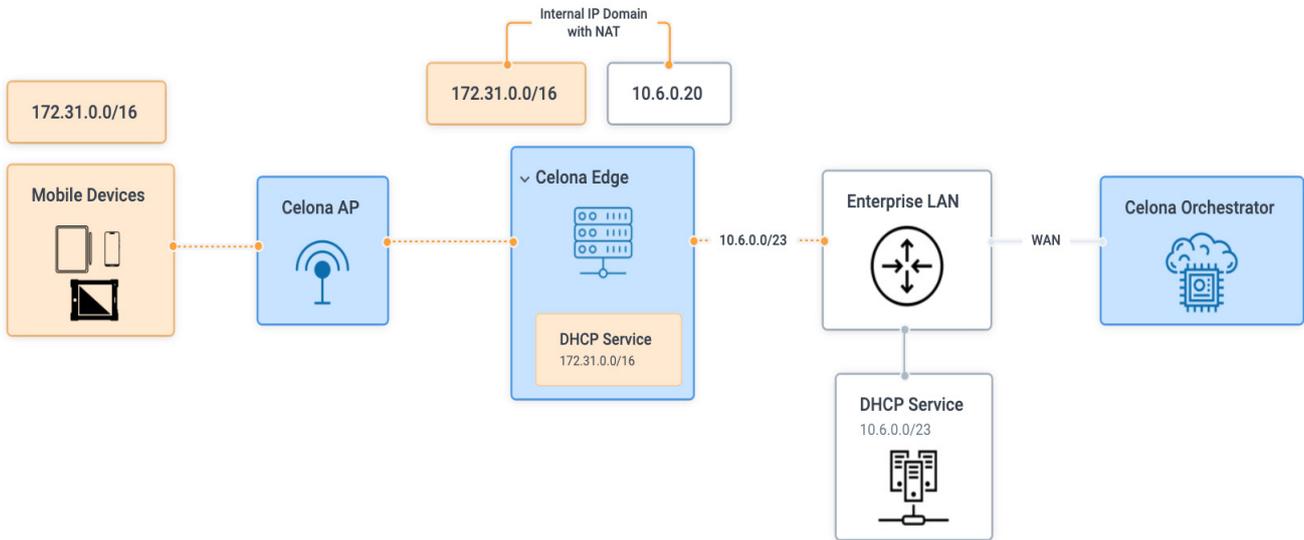


FIGURE 3 (right):
 Internal IP domain configuration options within the Celona Orchestrator

Add IP Domain

Name *
 MobileDevices

Type *
 Internal

Starting Pool IP

Ending Pool IP

Primary DNS Server

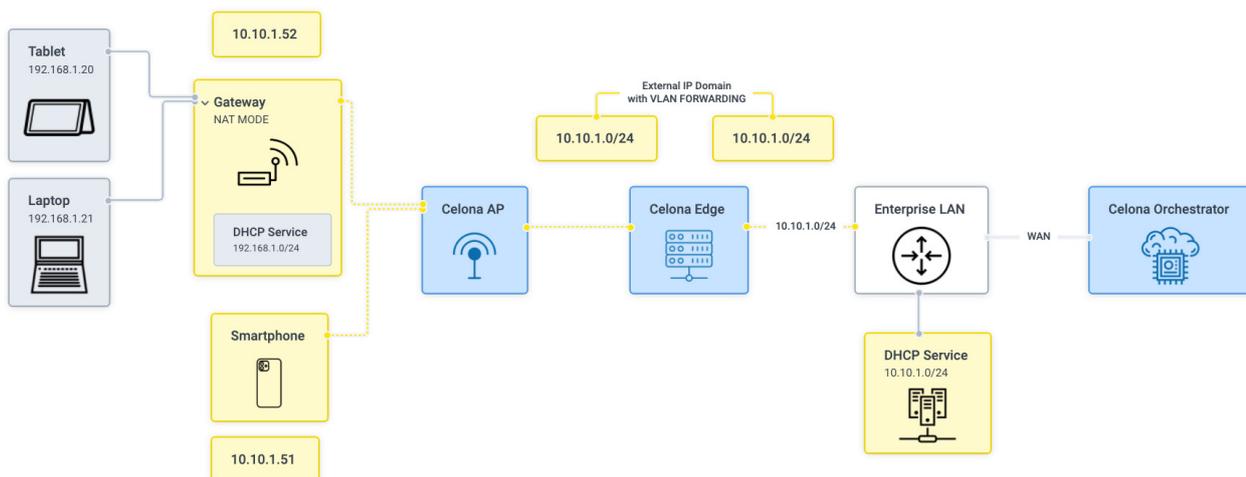
CANCEL ADD

External IP domain:

Alternatively, a Celona Edge cluster can be configured as an external IP domain (as shown in the diagram below) so that private cellular client devices join the corporate LAN. This mode allows the private 5G network to connect directly to the corporate LAN by way traffic forwarding into one or multiple layer 2 network segments (VLANs). Thus, the local LAN has visibility into natively connected devices such as the smartphone and mobile gateway, and 5G LAN devices are now directly accessible from the corporate LAN. However, note that the tablet and laptop that are behind the mobile gateway remain hidden from the LAN.

When this IP domain option is used, DHCP and DNS can be configured and managed on the corporate LAN. In the following figure we again have a Celona 5G LAN connecting to the corporate LAN.

FIGURE 3 (below):
Logical topology for external IP domains



Add IP Domain

Name *
MobileRouters

Type *
External

DHCP Server
Leave this field empty if you want to broadcast DHCP request.

VLAN
Leave blank to use default VLAN. VLANs are unique numbers between 1 and 4094

VLANs in use: 101,102,104,172,105,103

CANCEL ADD

FIGURE 4 (left):
External IP domain mode configuration options for the Celona Orchestrator

Supernetting

As mentioned previously, the use of 5G mobile routers such as those from Cradlepoint, Sierra Wireless and Inseego are a great option when seeking to connect non-5G capable devices to a 5G LAN. However, the caveat to this architecture is that external visibility is lost along with the need to manage multiple IP subnets and DHCP scopes for each 5G mobile router. These management headaches are due to the need for NAT to be performed on the 5G mobile router.

Fortunately, Celona has solved both challenges through the use of supernetting managed at the Celona Edge.

Supernetting on a Celona 5G LAN can be implemented in just a few steps. First, the Celona Edge cluster must be configured as an external IP domain. Once this is setup, network address translation (NAT) can be disabled on the 5G mobile routers and routing mode can be used for multiple connected non-5G capable devices with all DHCP, DNS, and routing being relayed upstream to the Celona Edge.

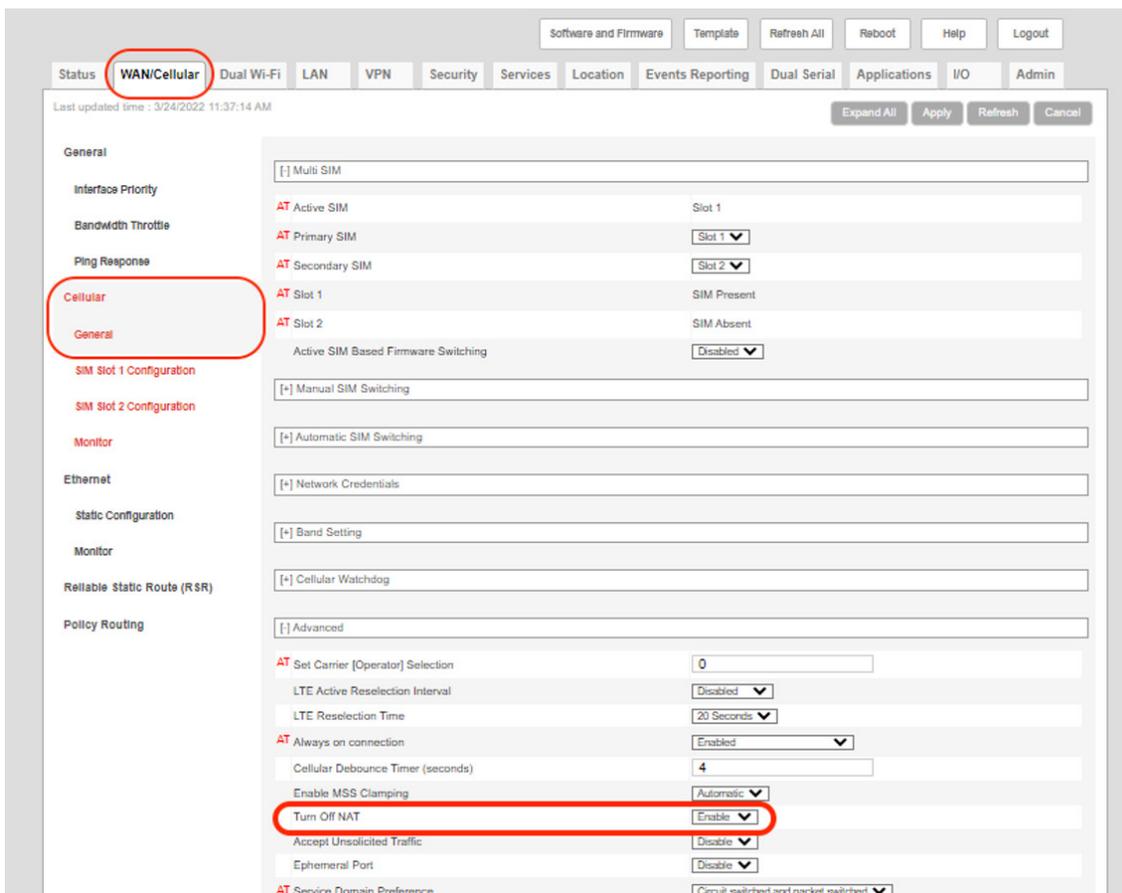


FIGURE 5 (above):

Screen capture shows how a Cradlepoint 5G mobile router can be set to disable NAT mode.

To complete the use of supernetting, the Celona Edge can be configured to automatically discover connected mobile routers and the endpoints sitting behind those routers. The Edge server intelligently routes each endpoint IP address to its corresponding 5G LAN mobile router.

Using supernetting concepts, the corporate LAN is provided a route to the remote device subnet that points to the Celona Edge. The Celona Edge then maps each remote device IP to the corresponding 5G interface of the Mobile router they are directly connected to. Figure 6 below shows the 10.30.1.0/24 network is used by devices sitting behind two mobile routers. On the 5G LAN side, we have our Edge cluster configured as an External IP domain and with route management entries for end devices behind the mobile router. With this supernetting configuration option customers gain end-to-end visibility while consolidating device subnets sitting behind multiple routers for improved ease of management.

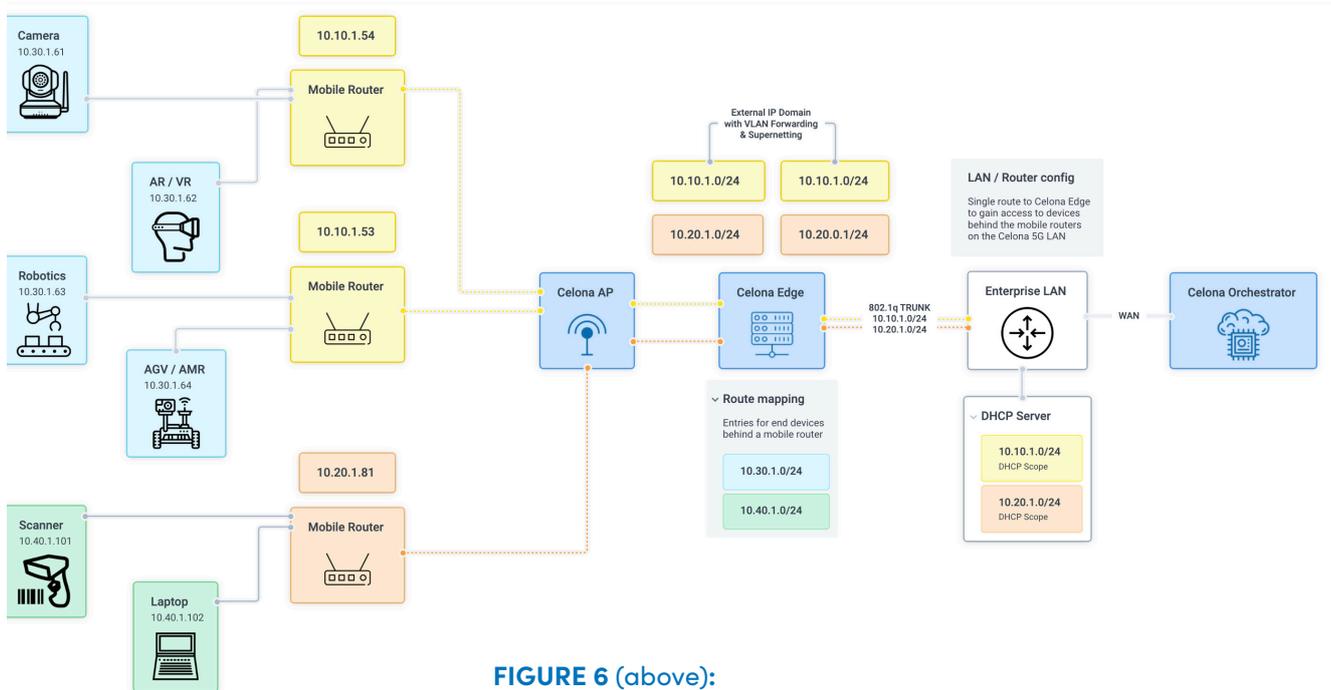


FIGURE 6 (above):
Logical topology for external IP domains with supernetting

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